ON PARALYTIC, NEURALGIC,

AND OTHER

NERVOUS

DISEASES OF THE EYE.

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(From the Dublin Medical Press.)

JANUARY 6, 1841.

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PROVISIONS FOR ADJUSTING THE EYE.

The division of the muscles of the eye, for the removal of squint, has excited so much attention, and led to so much interesting and useful discussion, relative to the motions of that organ, that I think any information calculated to throw light on the subject must be acceptable. I have, therefore, put together the following observations, and offer them as a contribution to a stock of materials, to be used hereafter for the resolution of difficulties which have hitherto baffled our researches. The subject, it must be admitted, is one of the highest interest, not merely in connexion with ophthalmic medicine, but as affording physiologieal and pathological illustrations of the utmost value, and of the most instructive nature. I do this, also, because I am most anxious to convinee the members of our profession that the study of diseases of the eye is worthy of the attention of the most enlightened; and that from it information is to be derived which the contemplation of the diseases of no other organ affords. It is most distressing and humiliating to find even well-informed persons impressed with the idea that nothing more is required for the suceessful practice of ophthalmic medicine than the skill to perform a surgical operation on the organ: that it is, in fact, a kind of handicraft. The following inquiries, amongst others, will, I hope, assist in dispelling an error so injurious to the study of the subject. Before, however, attempting to investigate the causes, symptoms, and consequenees of *paralysis* affecting the muscles of the eye, it is expedient to remind the reader of their arrangement and uses; and with this view, it will be necessary to enter into details, which practical men may not relish. I cannot, however, otherwise hope to make the information I have to communieate intelligible.

Of the meehanieal contrivanees of the animal

frame, I know not any more beautiful or perfect than those for adjusting the eye in order that a perfect image may be brought to its proper place on the retina. There is, first, the admirable and perfect universal motion of the head upon the spine; and next, the equally perfect motion of the eye in the orbit. Without entering into a detailed anatomical description of the provisions for securing this universal motion of the head on the spine, it may be desirable to remind the reader that it is the result of the beautiful combination of joints between the occipital bone and two superior cervical vertebræ, as well as of the connection of the other cervical vertebræ with each other; and that it is effected by muscles of every size and direction. Recollecting this, and remarking how necessary these motions are for the correct and easy application of the eye to its destined purpose, it must be admitted that this is a principal object in this most elaborate combination of mechanical arrangements. It is true that other organs of sense are placed in or on this moveable sphere, the head; and that the prehension of food and exercise of the voice demand similar aid; but the perfection of hearing, taste, or smell, feeding or speaking, does not depend on the integrity of the parts to which I allude so much as sight. It is only necessary to observe the awkward and distressing carriage of those deprived of the perfect motion of the head on the spine, in their attempts to look around them, and to witness the distortion and stoop produced by the habitual efforts to avert the eyes from light in mismanaged or neglected ophthalmia to be convinced of this. The extent to which the application of the eye depends on the motions of the head and neck is also exemplified in many animals. It is only necessary to contrast the expressive motions of the head in the horse, while intently viewing objects, with the equally expressive motion of the eye in the elephant. In the one case, the free motion of the spinal joints enables the animal to bring the retina to its proper place in relation to the object: in the other, this is effected by a more extensive motion of the eye itself. Hence the apparently bold and steadfast gaze of the former, and the remarkable scowl or glance of the latter. The absence of this mobility of the head and neck in the cetacea and many fishes is compensated for by the free motion of the whole body in its fluid

medium. I only briefly and hastily allude to these points in order to direct attention to them: the subject, if followed up, would afford valuable instruction to painters and sculptors, as well as to the physiologist.

While nature has made this admirably perfect provision for the application of the organs situated in the head, additional provision is made for the more exact and delicate adjustment of the eye. This organ enjoys a perfect, universal or ball-and-socket motion in the orbit, although restricted. I do not mean to say that the mechanical provision of true ball-and-socket exists, but there is a provision equivalent to it and a corresponding extent of motion. The socket called technically the orbit, does not fit the ball closely; it only forms an irregularly-shaped large case round it, the intervening space being filled up with soft parts, which might, perhaps, be compared to a soft, flexible, compressible, and elastic padding, principally composed of cellular membrane, rendered firmer by a deposit of fat in its texture: a beautiful example of the yielding solid which, in the animal frame, admits of motion as free as that permitted by a fluid. Attention should be paid to the nature and extent of the resistance and support given by this suspending medium. Its delicate and yielding nature proves that the action of the muscles which move the organ involved in it, must be equally delicate, and that the notion generally entertained of their pulling or squeezing the eye, to keep it in its place, or alter its form, to adjust it to distance, must be erroneous. In paralysis of the greater number of the muscles, we do not find the organ fall from its place; neither, so far as I have been able to ascertain, is the adaptation to distance lost. The extent of motion, and consequently the amount of muscular action, is much less than is generally supposed from casual observation, and consequently the degree of contraction of each individual muscle must be very small. This point, it is important to establish, because it proves that slight disturbing causes may influence these contractions, and lead to irregularity in their effects.

MUSCLES OF THE EYE.

The eye-ball is moved in the socket, as every one

knows, by six muscles, four extending from the bottom of the socket or orbit behind, to the front of the sphere, and two from the inside of the socket to the opposite side, and a little to the back part of the sphere. Of the four straight muscles which come from the back of the orbit, and are inserted into the front of the eye-ball, one, the superior or *elevator*, comes over the eye-ball; the other, the inferior, or *depressor*, passes under it; the third, the internal or *adductor*, lies on the inside; and the fourth, the external, or *abductor*, runs on the outside. All are inserted by flat tendons about a third of an inch behind the margin of the cornea; the line, or edge of the end of the tendon, not being straight, but curved at the place of insertion, and the internal or adductor being inserted nearer the cornea than the abductor. With reference to the action of the muscles, a slight difference as to the distance of the insertions from the cornea is of no great consequence, but as a guide in operating, it must be attended to. Mr. Lucas, who has published a useful and well-considered book on squint, has carefully examined these insertions since the subject attracted attention, and has furnished more exact information respecting them than was previously extant. He says, "All the muscles of the eye are inserted by flat, shining, parallel, tendinous fibres, into the sclerotica, and this membrane, which forms the case of the eye, being globular, the shape of the insertion of each muscle necessarily forms a portion of the segment of a circle, the convexity towards the cornea: the consequence of which is that the centre of the insertion is nearer the cornea than its ends; a fact which would be likely to make a careless operator suppose that he had divided all the tendon of a muscle he was operating upon, when he had only divided its central fibres, leaving the extremities still attached. The tendons of the superior and inferior recti muscles are of equal breadth at their insertions, and the breadth of the internal rectus exceeds the breadth of the external by nearly one-third. In the well-proportioned eye of an adult, the centre of the tendon of the superior rectus, and that of the inferior rectus, are at an equal distance from the cornea, viz., four lines; the inner edges of each are about the same distance, whilst the outer edges are considerably more removed, being distant seven lines. The centre of the tendon

of the internal rectus muscle is distant from the cornea about three lines, its superior edge is distant four lines, and its inferior edge five lines. Contrasted with the tendon of this muscle, that of the external rectus is distant at its centre, from the cornea, nearly five lines, and its superior and inferior edges are distant nearly six lines."

I have said that in addition to these four straight muscles which run from the bottom of the orbit to the front of the eye-ball, there are two which run from the inside of the orbit to the outer side and back part of the eye-ball. These are called the oblique muscles, and might with propriety be designated the rotatory. The superior does not actually arise from the internal part of the orbit; it comes, as the four straight muscles, from the bottom of the orbit, but as its tendon passes through a pulley attached to the upper and internal part of the orbit, it acts from that point. It may, therefore, be said to run from the inside of the internal angular process of the frontal bone to the outside and back part of the eye, passing between the eye-ball and the superior straight muscle or *elevator*, and inserted in the space between the elevator and abductor, and at about an inch from the cornea. The inferior oblique rises from the opposite side of the orbit below, being attached to the maxillary bone just below the groove which lodges the lachrymal sac, and scarcely a quarter of an inch within the orbit. It runs between the inferior straight muscle or depressor and the floor of the orbit, and is inserted nearly opposite the insertion of the superior oblique, more than an inch from the cornea, and rising above the external straight muscle or *abductor*.

With respect to the action of the muscles of the eye, or the effect of their contractions on the globe there has been much difference of opinion, yet it appears to me, that the matter is simple enough. From attentive observation of the motions of the globe, it is obvious that it is turned in every possible direction; not merely upward and downward, inward and outward, but diagonally in every intermediate direction; upward and outward, upward and inward, downward and outward, and downward and inward: in fact, that the motion is as universal as that of the ball-in-socket. The amount or extent of the motion is, however, much more limited than at first sight ap-

pears. In the horizontal direction, which is perhaps that in which it is the greatest, the edge of the cornea is seldom carried farther than the angles where the lids meet. The assumption that the eye-ball is pulled back or drawn forward in the orbit by the muscles, seems unsupported by positive proof, and contrary to observation: this action appears to me to be confined to the rotation of the organ, and not to affect its position in the orbit, which must be steadily maintained for the due performance of its functions. Looking to the attachments and direction of the muscles, it is obvious that the *depressor* and *elevator* cause the sphere to revolve, as if around a transverse axis, directed from the temple toward the nose, while the *abductor* and *adductor* cause it to revolve round a vertical axis directed from the roof to the floor of the orbit. A third revolution round a longitudinal axis, directed from the open of the orbit to its bottom, is effected by the two oblique muscles. The intermediate motions, must depend either on the combined actions of any two of these, or on the contraction of lateral portions of the fibres of single muscles. If, for example, the *abductor* and *depressor* act together, they may direct the cornea downward and outward, or if the *elevator* and *adductor* combine, they may turn it upward and inward. The two oblique muscles, not running from the inside of the orbit directly outward, but inclining backward, until they become attached on the posterior part of the eye, not only cause the sphere to revolve on its longitudinal axis, but probably change the direction of that axis; the inferior directing the cornea perhaps a little upward and inward, and the inferior a little downward and outward. I have, however, great doubts as to the actual production of this effect. That the inferior oblique causes the eye-ball to revolve round its longitudinal axis, may fairly be inferred from its attachments, but that it alters the direction of that axis in any considerable degree, cannot be so easily admitted. We cannot observe the action of this muscle distinct from that of the others, but we can that of the superior oblique. In cases of paralysis of the three straight muscles, the inferior oblique, and *elevator* of the upper lid, from disease affecting the third pair of nerves, the action of the *abductor* supplied by the sixth nerve, and of the superior ob-

lique supplied by the fourth, remains unimpaired. The patient unable to raise, depress, or turn in the eye, or elevate the upper lid, turns it out as effectually as ever, when directed to do so; and when directed to look downward, the action of the superior oblique is clearly distinguished. It is a delicate rotatory motion, with perhaps a very slight inclination downward and outward. Of this I have now no doubt, having repeatedly within the last two years observed it, and pointed it out to the students. There was lately a man in the City of Dublin Hospital, who had all the muscles of the eye, except the superior oblique, paralyzed from disease affecting the third and sixth nerves, in whom this action of the superior oblique was easily recognized. It is obvious also from observation in such cases, that the superior oblique is like all the others, a voluntary muscle. Sir Charles Bell, although he does not take exactly this view of the subject, has corroborated it by experiment. He divided both the superior and inferior oblique muscles in monkeys, and found the voluntary motions unaltered, because, as I conceive, the action is so slight and delicate, that its loss could not be perceived.

Mr. Duffin, of London, who has lately published an interesting and instructive work on the operations for *strabismus*, has made some experiments on animals to determine the uses of the muscles of the eye, which I think also corroborate this conclusion that the action of the superior oblique is a very delicate one, although they may not exactly prove that it is slightly rotatory. After dividing all the straight muscles he says, "the pupil remained fixed in the visual axis of the orbit. When irritated, the eyeball was retracted, and the *membrana nictitans* was suddenly spread over the fore part of the eye at the same moment, so that it was quite impossible to decide what influence the oblique muscles exercised, or whether they produced any special movement at all. It was clear, however, that they neither drew the eye towards the outer nor the inner angle of the orbit," on dividing the superior oblique itself, "no apparent change occurred in the position of the pupil; nor could we perceive that the movements of the eyeball were in any way modified or destroyed by the operation." In these cases, I think the action to

which I allude, was not in the one recognized, because it is so slight and delicate, and in the other, its loss was not perceived for the same reason. I, this day, had an opportunity of witnessing the action to which I allude, in the case of a woman labouring under complete paralysis of the muscles of the right eye, supplied by the third nerve. The upper eye-lid is depressed as low as when the eye is closed in health, and she has no power of elevating it. When elevated by the finger, it remains so, or nearly so, until pulled down by the *orbicularis palpebrarum*. The eye is directed nearly forward, but inclines a little to the right, and when she is directed to look to the right, the abductor acts and effects that motion. On directing her to look down, the eye is distinctly twisted from the nose toward the temple, without any visible direction of the pupil downwards. It is a mere rotatory motion. When this effort is discontinued, the eye returns to its original position, as if by the elasticity of its other attachments, or by whatever provision exists to preserve it in its position, independent of muscular action. The eye is certainly more prominent than the other, but how far this is owing to the loss of muscular support is not clear, for I find that in this case, as well as some others, there is reason for supposing that there may be some disease in the orbit; the eye itself being tender to the touch; and although I do not believe that the eye depends on the muscles for maintaining it mechanically in its position, I can easily admit that paralysis of its muscles may be attended with some alteration in this respect. The pupil, in this case, is fully dilated, but vision is as good as in those who have the pupil dilated with belladonna. The woman has been nursing for twelve months, and has had head-ache and giddiness. The disease has existed for about a month.

It is not easy to explain by mere written descriptions, without apparatus, diagrams, or dissections, even simple contrivances, especially to those not familiar with such inquiries, or habitually considering them; I fear, therefore, my readers may not understand from what I have said the very simple application of muscles to the motion of the eye-ball. The matter may be made more familiar thus. Suppose a needle passed through the eye-ball from the temple toward the nose, the *rectus superior*, or *levator oculi*,

and the *rectus inferior*, or *depressor oculi*, will turn the eye-ball on that needle, as on an axis or spindle, and thus raise or depress the cornea; or in other words, turn the eye up and down. Suppose, again, a long needle passed through the centre of the eye, from the roof to the floor of the orbit, the *rectus internus*, or *adductor*, and the *rectus externus*, or *abductor*, will turn the eye ball on that as on an axis, and thus direct the cornea in and out. Here, then, are the two essential motions, the vertical and the horizontal. A third, however, is wanted, and it is obtained in an equally simple way. Suppose a needle passed through the centre of the cornea, and on, through the eye-ball, to the bottom of the orbit, the two muscles, not, perhaps, very happily called oblique, (obliquus superior and obliquus inferior) running from the inside of the orbit, and attached to the outer or temporal side of the eye-ball cause it to revolve round that needle as an axis. Nothing can be more simple. By these six muscles thus disposed, the eye-ball enjoys the same power of movement that is possessed by a compass, up and down, in and out, and round about. But more than that. In consequence of some slight obliquity of direction, variety of insertion, or extension of insertion, every possible intermediate motion is secured, and the instrument, if we may so call it, is thus adjusted to every object. The simplicity of the provision is as beautiful as the effect is perfect. It is an admirable example of muscular application to the production of the precise motion required.

NERVES OF THE EYE.

The distribution of nerves to the eye and its muscles is very remarkable, and a knowledge of their origin and termination is necessary to enable the student to comprehend the effect of their influence on the actions performed. We have not here, as in other places, one nerve divided into many branches to supply various muscles, but distinct nerves from totally different sources, devoted to one or more. Of the four straight muscles, three, the *levator*, *adductor*, and *depressor*, are supplied by one nerve, the third; while the fourth, or *abductor*, is supplied by another, the sixth. Of the two oblique, one, the

superior, is supplied by the fourth nerve, while the inferior is supplied from the same third which supplies the three straight museles. The elevator of the upper lid (*levator palpœbræ superioris*) is supplied from the third nerve, while the muscle whieh closes the lids is supplied from the fascial, (*portio dura*) or seventh. Besides these four nerves of motion, there are three others upon the integrity and vital perfection of whieh vision appears more or less to depend: the optic, sensible, probably to the impression of light only; the fifth provided for general sensation, and exercising some influence on the nutrition and sensibility to light not well understood; and the sympathetic, by whieh a connexion is established between the eye and those numerous organs to which that division of the nervous system belongs. It should be reeollected that the third nerve thus supplying the *levator*, *depressor*, adductor, and inferior oblique, as well as the elevater of the upper lid, and the iris, rises from the *crus cerebri*, near the *pons Varolii*. That the fourth, destined to the superior oblique exclusively, rises from the opposite surface, the lateral part of the valve of Vieussens ; and the sixth, devoted to the *abductor* alone, comes from the *corpus pyramidale* at its junction with the *pons*. These three origins, so distinct and remote from each other, shew that the action of the muscles, supplied by these nerves, must be equally distinct and independent. It must also be recolleeted that the eourse of these nerves to their destination, and their connexions and relations are equally different, and that pressure or disease may, therefore, impair or destroy the function of one without at all injuring that of the others. I cannot admit the assumption that the origins of the third and sixth nerves are identieal, beeause they come from parts which are continuous ; it is an inference derived from what may, perhaps, be called the theoretical anatomy of the brain, and one of those conclusions resting on similar grounds which have retarded the progress of inquiry as to the functions of the nervous system.

Thus do we find this one small organ influenced by seven nerves, and probably depending on every one of them for its perfection and correct application; the optic for vision, the third, fourth, sixth and seventh for motion, the fifth for general sensation, and the sympathetic for some effect not aseertained.

I have shewn that the origin, course, and terminations of the third, fourth, and sixth nerves are distinct and separate, that of the optic and fifth are equally so, and the communications between the sympathetic and the third and the sixth are obvious and constant. The intricate connexions of the ophthalmic branch of the fifth are not, however, fully settled, notwithstanding the labours of the most distinguished anatomists. Some deny, or assume, or appear to assume, that the muscles of the eye do not receive branches from it or any other part of the fifth pair; yet Soemmering, Mr. Swan, and Mr. Dalrymple, describe an anastomosis between the fourth and fifth. Soemmering also says, that a twig of the nasal branch of the ophthalmic of the fifth joins the branch of the third, supplied to the *rectus superior* or *levator*, and Mr. Dalrymple corroborates this. The branch of the third, supplied to the inferior oblique, has a twig of inosculation or anastomosis, with the lenticular ganglion, which is formed by a union of the third and fifth. The sixth supplied to the *abductor* also communicates with the fifth. All this may appear unnecessarily minute; but when we come hereafter to consider the effect of neuralgic or paralytic affections of those nerves on the motions or functions of the eye, we shall see the necessity of the inquiry. The influence exercised by the fifth nerve, as a nerve of sensation, and of the sympathetic as the nerve of communication with the thoracic and abdominal viscera, demands the greatest attention and most careful study.

PARALYTIC AFFECTIONS OF THE EYE IN GENERAL.

Paralysis of one or more muscles of the eye, from the same causes which produce paralysis of other muscles, is a common occurrence; and it is here we often see the first of a series of paralytic strokes which ultimately terminate the life of the patient. There is generally no question or difficulty as to their real nature and origin, and often very little as to their result. Indeed, so distinct and well-marked are they, and so easily traced to their origin, that no other forms of paralysis afford such clear and unequivocal evidence of incipient disease of the brain, its

membranes or vessels. It is not merely with reference to ophthalmic medicine that these affections should be studied: a knowledge of them is essentially necessary to all who undertake the management of cerebral diseases. The pathological illustrations derived from observation of them are of the highest interest, and the facts elicited in the inquiry are of the most conclusive and valuable description. The effects of disease on each nerve is marked by corresponding results which cannot be mistaken. There is blindness from morbid changes involving the optic, paralysis of the *levator*, *depressor*, *adductor*, *levator palpebrarum*, and probably the *obliquus inferior* muscles from disease affecting the third; insensibility, defect, or loss of vision, neuralgia, and destructive inflammation, from disorganization of the fifth; paralysis of the *abductor* muscle from injurious impressions on, or actual change of structure, of the sixth; and paralysis of the orbicularis palpebrarum from destruction of the seventh. The effects on the superior oblique muscle from disease of the fourth nerve are not so easily recognised, in consequence of its delicate action being distinguished with difficulty: we shall, however, presently be able to shew, that certain, otherwise inexplicable, defects of vision, may be referred to paralysis of this muscle. Loss or injury of sight from some state of the sympathetic nerve not yet ascertained it must, perhaps, be admitted occasionally occurs, although not, perhaps, at all so frequently as is generally stated. The intimate connexion of this part of the nervous system, with the sixth pair of nerves supplied to the *abductor*, and the frequency of the squint from defective action of this muscle, is the best proof of such influence.

BLINDNESS FROM DISEASE AFFECTING THE OPTIC NERVE.

Sight may be suddenly impaired or destroyed by a paralytic stroke producing this effect alone, or at the same time hemiplegia or other extensive palsy. If unaccompanied by loss of power in any of the muscles of the eye, or abolition of its general sensibility, this must, in general, be attributed to some cause destructive to the optic nerve somewhere from its origin to its

termination in the retina. I say in general, because diseases of the brain are sometimes attended with results which we should not have expected from their nature or locality. If a man becomes suddenly blind of one or both eyes, to what other cause can we attribute it, except to apoplectic injury of this nerve, or that part of the brain from which it originates? It cannot depend on injury of the third, fourth, or sixth nerves, because we have not paralysis of the muscles supplied by them accompanying the blindness, and because we know that disease, causing paralysis of them, is not attended with loss of vision. I may be told that this sudden loss of vision may depend on disease affecting the fifth nerve, because, as we shall see in the sequel, injury of this nerve is attended with defective vision and other consequences injurious to the organ. This defective vision, and these injurious consequences are never, however, I believe so sudden, distinct, and unequivocal as to justify us in attributing this well-marked blindness to this cause. Indeed, the part performed by the fifth pair of nerves in the function of vision is anything but settled, notwithstanding all the boasted results of experiments on living animals, and all the valuable information afforded by pathological observation. It may also be said, that sudden blindness or impaired vision may arise from derangement of function of some organ remote from the eye inducing this defect through the sympathetic nerve; and it must be admitted that there is some ground for supposing that such is occasionally the effect of this cause. We must not, however, allow ourselves to be deceived with respect to the real amount of this influence, or accept, as unimpeachable, the evidence so frequently offered of its being followed by this result. Blindness from this cause is comparatively rare, and when it can be fairly traced to it, is accompanied by such symptoms as enable the observer to distinguish it from that attending cerebral disease without much difficulty. My object here is not to establish a *diagnosis* between the defects of vision depending on disease affecting the optic, fifth, or sympathetic nerves: that would involve me prematurely in a discussion respecting the various forms of blindness incongruously collected under the title of *amaurosis*. I merely want to establish the fact of the occurrence of sudden blindness from apoplectic in-

jury of the optic nerve, or that part of the brain from which it originates. The best proof that this is the effect of the cause stated is, that *hemiplegia*, or fatal apoplexy, is as often found to follow sudden blindness as any other paralytic seizure. I have repeatedly found my *prognosis* of such results fully verified, and I now never fail to warn patients consulting me on this account as to the danger they have to apprehend, and the necessity of making such decided alterations in their habits and diet as may afford the best chance of averting it. I, some time ago, had an opportunity of witnessing a marked case of this kind in a neighbour. He applied to me on account of sudden blindness. There was no other derangement of any part of his frame. The action of the muscles of the eye was perfect. There was no loss of power of motion; no distortion of the mouth, thickness of speech, or other paralytic symptom. I immediately warned him to set his house in order, and to adopt a thorough and radical reform of habits and diet, and that if he did not, I should meet him some day or other trailing a powerless limb after him in the street. The prognosis was literally verified. In some months after I met him in the state I had predicted, and soon after heard of his death from apoplexy. Such cases must occur to every man in practice.

Blindness coming on more or less gradually from diseased condition of the brain, its membranes or vessels, is of much more frequent occurrence than the sudden blindness from apoplexy just noticed. It is indeed an every-day occurrence, and generally takes place without being accompanied by paralysis, either of the muscles of the eye or of any other part. It is in fact by far the commonest form of *amaurosis* in this country, as far as my experience goes, perhaps even commoner than that from inflammation of the eye terminating in disorganization of the retina, which also occurs so frequently: so much so, that I think I might safely say that nine-tenths, if not more of the cases of *amaurosis* which present themselves, especially in hospital practice, are the consequence of either of these two causes. I find little difficulty in distinguishing blindness from disease of the nerve, within the cranium, from blindness depending on destruction of the retina by inflammation, and thus proving that cerebral disease is the principal cause of

the various paralytic affections of the eye. The "head symptoms," as they are called, are generally unequivocal, especially pain and giddiness; but it is very remarkable that in the majority of these cases, there is often no other derangement of nervous function; no paralysis of the muscles of the eye; no loss of sensibility of its surface; no distortion of face; thickness of speech, hemiplegia, or diminution of that intellectual acuteness which characterises my countrymen. I think I have met with cases in which the sense of smell was lost with that of vision; but I am slow in reposing confidence in the statements of patients relative to symptoms respecting which they may deceive themselves. If this be the case, taken with other symptoms, it would lead to the conclusion rendered probable by other circumstances, that the diseased condition of the nerve arises from inflammation of the membranes of the base of the brain. I find, however, that while intent on establishing a physiological fact, I am running prematurely into practical details, to which I must hereafter return. Enough has been said to prove that the function of one nerve of the eye, at least, is impaired or destroyed by disease involving its origin or course within the skull.

PARALYSIS OF MUSCLES SUPPLIED BY THE THIRD NERVE.

Paralysis of the muscles of the eye, supplied by the third nerve, is not an unusual occurrence. It is noticed in all the books under the title of *ptosis*, from the falling of the upper lid. The paralysis is never, however, confined to the *levator palpebræ superioris:* the *rectus superior*, *inferior*, and *internus* are also affected; as is probably the *obliquus inferior;* but its action is so imperfectly understood from being mixed with that of the others, that we cannot well recognise the result of its loss of power. The eye is closed, and all power of raising the upper lid is lost; the eye-ball is also immovable, except outwards by the *abductor*, supplied by the sixth nerve, and in a rotatory direction in a slight degree, by the superior oblique, supplied by the fourth. Vision is, in some cases, little impaired; in others, it is almost lost. This must arise from the same disease which

affects the third nerve, extending to the optic, because it cannot be supposed that the integrity of the third nerve is essential to the sensibility of the retina. When dilatation of the pupil accompanies this paralysis, vision is as defective as it is when the pupil is dilated by belladonna. There is double vision and squint when the patient looks in one direction, none while he looks in the opposite: for this reason. Suppose the right eye affected: when he looks to the left side, the *adductor* muscle cannot act, being paralyzed; while the *abductor* of the left turns the eye in that direction. The axis of the right eye, therefore, no longer is parallel to that of the left, and consequently, the images of objects are not formed on corresponding points of the retina, and, therefore, two objects are seen, or there is double vision. But when the patient looks as directly forward as he can, or in any degree to the right, the *axes* preserve their parallelism by means of the *abductor* of the right eye, which is still active, being supplied by the sixth nerve, and vision is single. To ascertain all this, the upper lid must of course be sustained by the finger, while the experiment is made.

That this is, in many cases, a paralytic stroke, cannot be denied, especially when it occurs suddenly, and not preceded or accompanied by other symptoms of disease of the brain, its membranes, or vessels. I have seen it, as in the case of the optic nerve, the first paralytic seizure, and followed by *hemiplegia* and other formidable forms of apoplexy. The practitioner is, therefore, bound to view it very seriously. It is true that patients recover from it more frequently than they do from paralytic strokes affecting the optic nerve, and producing blindness; but that should not throw us off our guard. Mr. Mackenzie, in his valuable work on diseases of the eye, speaks of this form of paralysis as sometimes arising from cold, and being of a rheumatic character. This is certainly true: but, then, what is the precise effect of this rheumatic inflammation from cold? Where is the exact seat of the mischief? Not, I presume, in the muscles themselves; for, in that case, the *abductor* could scarcely escape; neither could we have such complete paralysis from rheumatic inflammation, without a corresponding degree of pain and tumefaction. If it be from rheumatic inflammation, caused by exposure to cold,

that inflammation must affect the nerve or its membranes, at its origin, or somewhere between its origin and its division, to supply the muscles. It cannot well be in its course through the *dura mater*, at the cavernous sinus, or we should perhaps have the fourth, first branch of the fifth, and sixth, engaged: it is therefore probable, that the seat of the mischief is the nerve or its coverings, between its origin and its entrance into the dura mater. I have seen this paralysis occur suddenly, without any other symptom of derangement of the nervous system, or, indeed, any great evidence of disease or disturbance in any other part of the animal economy, and have attributed it to derangement of stomach or bowels, or, in females, to interrupted uterine function, and, acting on this assumption, have removed it by simple means, and without much difficulty. Paralysis of the muscles of the eye, supplied by the third nerve, is not, however, necessarily a sudden occurrence: it frequently comes on slowly, and accompanied with other symptoms of disease of the brain or its membranes. In this case, our *prognosis* must be much more unfavourable than in those occurring suddenly, which often yield to the remedies usually adopted in similar cases. Indeed, I think that when the disease continues for a considerable length of time, with or without medical treatment, it must be attributed to cerebral disease, and treated accordingly.

Paralysis of the superior oblique muscle has not been noticed, because it is not easily detected. I have already said that I believe the action of this muscle to be very delicate, and confined to communicating a slight rotatory motion to the eye. The grounds upon which I have arrived at this conclusion are, repeated observations of cases of paralysis of the other muscles, from diseases of the third. It must, I think, be admitted that when the *levator*, *depressor*, *abductor*, and inferior oblique muscles are paralyzed, the eye must remain fixed, unless moved by the *abductor*, or superior oblique. That this is the case, an attentive examination of an eye affected with what is commonly called *ptosis* proves. The eye is turned out by the action of the *abductor*, supplied by the sixth nerve as perfectly as ever, and when the patient is directed to look downward, or towards his shoulder, the cornea is seen distinctly to revolve, with little if any depres-

sion of the pupil. In other words, the eye-ball is turned round its antero-posterior, or longitudinal axis. In this I think I cannot be mistaken, as I have repeatedly called those about me to observe the fact, in order to bear testimony to it. I have above alluded to a case in the City of Dublin Hospital, in which the four straight muscles of the eye, with the elevator of of the upper lid, and probably the inferior oblique, were paralyzed from disease of the third and sixth nerves within the skull, and in which this delicate rotatory motion was obvious. If the action of the superior oblique be to turn the eye downward and outward in a considerable degree, there could be no difficulty in demonstrating that action, in the case of the other muscles to which I allude; yet this cannot be done, but on the contrary the delicate rotatory action to which I allude is the result of the effort. The next question, however, is, whether paralysis, either sudden or slow, of the superior oblique, takes place or not; and this question is not, I admit, so easily resolved by demonstration. One thing must, however, be admitted, and that is, that it is most improbable that this superior oblique muscle, and the fourth nerve which supplies it, should be exempted from disease or its consequences, while the other nerves and muscles so frequently suffer. On the contrary, looking at the remote origin of the nerve, the length of its course, and its small dimensions, we should rather expect to find it more frequently engaged than any of the rest. If the action of the muscle be what I say it is, it is no wonder that paralysis of it should be difficult of detection, while all the other muscles are in a state of activity. Its loss is not perceived in the multiplicity of the other motions. There is, however, I think, good grounds for supposing that the consequences of such paralysis are occasionally evident. There are certain cases of anomalous and unintelligible defects of vision, which can scarcely be accounted for in any other way than by attributing them to this cause. I allude particularly to double vision with great confusion of sight, and with little or no squint. Such is a case recorded by Mr. Mackenzie, and designated *monoblepsis*. There was double vision, and when the patient looked downward, he lost sight of objects; while, when he looked upward, he saw them well enough; he also saw objects quite well with

either eye singly. It is not said whether or not he squinted, but it is most probable that he did not, as so marked a symptom was not likely to be overlooked. He had vertigo, and serious symptoms of disease within the head. A case somewhat similar is recorded by Sir E. Home, in the Philosophical Transactions for 1797. Here, also, there was double vision, but only of objects at three yards' distance, but not of those nearer. It is not said that he actually squinted, but that when he looked at an object, it was observed that his eyes were not equally directed to it. A third case is quoted by Mr. Mackenzie, as having occurred to Mr. Reed, where vision was very imperfect while both eyes were open, but good enough when one was closed: it is not stated that he squinted. I have certainly met many similar cases, but not taking this view of them at the time, did not pay that attention to them I now should. One gentleman, I recollect, complained that at table he saw those opposite him double, while objects near him appeared single. While writing this I met with another case. The patient, a young woman, looking pale and sallow, and evidently out of order, complains of giddiness and headache. She sees near objects correctly and single, but distant ones appear double and confused. There is no squint or other evidence of paralysis of the parts supplied by the third or sixth nerves. Much of the defect of sight in these cases arises from the double vision, which is very distressing, and causes much confusion while the patient is in motion, as in walking or riding; and the improvement from closing one eye probably depends on the removal of this cause of disturbance. The inability to distinguish objects when looking downward is more unintelligible. From the well-known experiment of Mariotte, it appears that there is a spot of the retina insensible to light. Could this defect arise from a projection of the image of an object on this part, in consequence of incorrect adjustment, from paralysis of this muscle?

PARALYSIS OF THE ABDUCTOR SUPPLIED BY THE SIXTH NERVE.

Sudden paralysis of the *abductor* or rectus *externus* muscle is not an uncommon occurrence although I do

not find it much noticed in the books. I think I meet it as often as paralysis from disease of the third nerve. The patients' cause of complaint is the double vision which attends the disease, and the consequent distressing confusion of sight, rendered still more distressing by motion of the body. It occurs suddenly as in the cases of *ptosis* above alluded to, and is often, if not generally, unattended with any other paralytic affection or symptom of disease of the brain, its membranes, or vessels. As in paralysis of the muscles supplied by the third nerve, there is squint and double vision when an effort is made to direct the eyes in one direction, while there is none when, the eye is turned to the other side. Seating the patient before me, I desire him to look directly at me, which he can do, or nearly do, without squint or double vision. I then direct him to look to the right, if it be the *abductor* or external straight muscles of that side which is affected; upon which the squint and double vision are complete, the left eye being turned toward the nose, while the right remains fixed. On directing him to look to the left, both eyes move correctly, and in unison, the *axes* preserving their parallelism, and consequently, there is neither squint or double vision. It is scarcely necessary to say, that this paralysis must be from disease affecting the sixth nerve, somewhere from its origin to its termination in the abductor muscle; but that the nature and extent of that disease is more difficult of explanation than even that causing paralysis of the muscles supplied by the third. The course of the nerve is longer within the cranium, its relation to the cavernous sinus and carotid artery is more intimate, and its connexion with the sympathetic much more interesting and important. It should therefore be more liable to have its functions impaired from disease within the skull, from turgid or obstructed arterial or venous circulation, or from the influence, whatever it is, which appears to be exercised by disease or impaired function of remote organs. When this paralysis occurs without any other remarkable symptom of cerebral disease, I think it generally yields to simple treatment, or even disappears without any treatment at all; but when it is accompanied by blindness, paralysis of the other straight muscles, severe headache, giddiness, or other consequence of disease of the brain, its mem-

branes, or vessels, a very different *prognosis* must be given.

EFFECTS PRODUCED THROUGH THE SYMPATHETIC NERVE.

Writers on ophthalmic medicine, have been in the habit of attributing many forms of defective vision to the influence of disease or impaired function of the stomach, liver, intestines, and other organs, exercised through the remarkable connexion which exists between the sympathetic and the nerves of the eye. In many cases, however, this conclusion is adopted without adequate evidence of its truth, and is often a purely gratuitous and unwarranted assumption: so much so, that I am persuaded that no other preconceived theoretical inference has been attended with more injurious consequences, by diverting the attention of the practitioner from the real seat of the disease, either in the brain or the eye itself. The strongest evidence however adduced in favour of the conclusion that impaired function of the stomach or alimentary canal, leads to impaired function of the organ of vision, is the fact of squint so often apparently following or attending derangement of the stomach or bowels, and so frequently depending upon defective action of the abductor muscle, supplied by the sixth nerve, which is so intimately connected with the sympathetic. I do not mean to say that squint from defective action of the *abductor* muscle, so often arises from derangement of the stomach or alimentary canal, as is generally supposed, but it may I think be admitted, that it often does occur from this cause. That this effect is the consequence of this cause is one thing, that it follows from the connection between the sympathetic and the sixth pair is, however, quite another affair. There are many other ways of accounting for it, perhaps more rational and safe. It may depend on some state of the nervous centre generally, induced by the gastric derangement, or it may arise from some condition of the vascular system not easily detected. The intimate connexion of the sixth nerve, with the cavernous sinus and carotid artery is quite as remarkable as its connexion with the sympathetic. Be the cause what it may, it

is a question highly interesting and important to determine whether or not this disturbance of the balance of power betwen the *adductor* and *abductor* is to be attributed to a slightly paralytie condition of the latter. A paralyzed muscle is not necessarily totally paralyzed, it may be only partially or slightly affected. This we see in *paralysis* of the other muscles from disease of the third nerve, where often the power is only impaired, not totally lost, and during recovery, its gradual restoration shews us elearly that the defeet may exist in different degrees. The imperfect action of the *abductor* muscle which permits the *adductor* to turn in the eye in convergent squint, may, therefore, perhaps be considered a slight paralytic affection. I think we might even say, that it is only the involuntary action which is impaired, the power of contraction in obedience to the will remaining perfect. I wish, however, to be understood, as rather throwing out these suggestions to promote inquiry, than attempting to determine the matter without further consideration.

CONSEQUENCES OF DISEASE OF THE FIFTH NERVE.

From the investigations of Sir Charles Bell and others, and the numerous observations which have been made in consequence of them, there can now be no doubt that the general sensibility of the eye depends on the branch of the fifth nerve distributed to it. There are also good grounds for believing that this nerve exercises some influenee, not yet well understood on its visual funetions and nutrition. Numberless cases have been recorded, where loss of sensibility of the surfaee of the eye, neuralgia, and inflammation terminating in destruction of the cornea have been traced to disease of this nerve, and where injury of its branches has been followed by impaired vision. Experiments have also been performed on living animals, by Dr. Majendie, of Paris, and others, to prove the same thing, and although we cannot attaeh mueh value to them, or repose mueh eonfidenee in the assumed results, they tend to strengthen the conclusions derived from pathologieal observations. The subject, however, is still involved in so mueh obscurity, and requires for its elucidation sueh length-

ened inquiry, that I cannot at all undertake to do justice to it here. I have not observed sudden abolition of the functions of the fifth nerve indicated by loss of sensibility, impaired vision, neuralgia, or destructive inflammation, neither have I been able to discover such cases in the books; but examples of this form of disease coming on slowly, and accompanied by symptoms of cerebral disorganization are not very uncommon. The nature and amount of the influence exercised by the fifth nerve on the functions of the eye still, however, remains to be determined. That the sensibility of the organ is derived from it cannot now be denied; but how far perfect vision depends on it, or how far the sight is impaired by injury or destruction of it, is not settled. The experiments made on living animals, to determine the point, are, as I have said, of little value; and the eye is so soon attacked with destructive inflammation, when the nerve suffers from disease, that the previous condition of it, as to vision, cannot be ascertained. Even when blindness accompanies complete loss of sensibility, we cannot positively say that it is from disease of the fifth alone; the optic may be involved in the mischief. It is much to be regretted that the determination of this point, so interesting and important in a physiological point of view, has been so much overlooked in those cases where it might have been ascertained. In many instances of complete loss of sensibility, and where the eye has not yet been injured by inflammation, the state of vision is not alluded to. In one, however, a man of the name of Windsor, recorded by Sir Charles Bell, the requisite information is afforded. This man, in consequence of injury of the head, had dreadfully severe pain of the forehead and cheek, giddiness, hemiplegia, and paralysis of the *levator palpebræ superioris*, and all the muscles of the eye. The surface of the eye was quite insensible to touch, yet he retained vision in it during many months, although the pupil was dilated. Some time after, (the precise period is not stated,) vision was almost entirely lost, as well as the hearing of the same side, and the muscles of the face became paralyzed. Here, then, do we find vision at first remaining, although, the third, fifth, and sixth nerves are injured or destroyed, and not materially impaired until the disease extends and involves the optic nerves.

The subsequent dissection verified this. A tumor was found growing from the base of the skull, and embracing or compressing these nerves, which were also in a state of disease. In another case, also recorded by Sir C. Bell, (Godwyns,) there was severe pain, loss of sensation, and *paralysis* of the temporal and masseter muscles. The muscles of the eye-ball and lid supplied by the third nerve were also paralyzed, and his right arm and left leg were numb and weak: yet the vision remained in both eyes. These two cases, recorded on such authority, are, in my opinion, sufficient to prove that vision is not necessarily lost in consequence of destruction of the fifth nerve; but on the other hand it must be admitted, that in other cases, vision was lost, although there was no positive evidence that the disease extended to the optic nerve: still, however, there was no evidence that it did not.

Although it thus appears that the fifth nerve is not absolutely essential to vision, there can be no doubt of its exercising an important influence on the functions of the organ. In almost all the cases of loss of sensibility of the eye from disease of the nerve, a destructive inflammation terminating in slough or ulceration of the cornea has been the consequence. This, Sir C. Bell appears inclined to attribute to the injury the eye sustains from its loss of sensibility exposing it to the continued contact of irritating matters which, in a perfect state are removed by the motion of the lids called forth by the pain they produce. This view, I, however, think he may feel inclined to modify on reconsideration. The destructive ulceration of the cornea in these cases is peculiar even in appearance, and comes on much too rapidly to be attributed to this cause. The inflammation which attends exposure of the eye from paralysis of the *orbicularis palpebrarum*, or from eversion of the lids from burns, is very different both in its progress and results, and may very fairly be attributed to the mere exposure of the eye. This appears to me to be a point of more practical importance than is generally supposed. I have no doubt that inflammatory affections of the eye are often greatly modified by, if not altogether depending on, derangement of function of the fifth nerve. In some cases of slight conjunctival inflammation there is a degree of distressing teasing

pain, with intolerance of light, which cannot be accounted for from the state of the membrane, and in other cases of protracted inflammation terminating in destruction of the cornea the pain is obviously the same which accompanies disease of the nerve. The destruction of the cornea, which usually attends disease of the fifth nerve, does not, I believe, occur in those cases only in which sensation is lost; I have seen it where severe neuralgia alone existed, and where the surface never became insensible, although the neuralgia continued for years after the eyes were destroyed, and all inflammation had subsided.

Although many of the cases on record of loss of sight from injury of the supra-orbital branch of the fifth nerve are inconclusive, there is good ground for supposing, that in some vision has actually been impaired or destroyed by such an accident. It is true, that in perhaps the majority of these cases, the mischief was not confined to the branches of the fifth nerve, but extended to the brain itself, and involved other nerves, and therefore, probably the optic; but in some, it must I think be admitted, that the mischief was confined to the fifth nerve, and being merely a slight wound or puncture could not have affected the brain, except through the nerve wounded. On the other hand, there is scarcely any other nerve in the body so exposed to injury of its branches, or which so frequently suffers as the fifth; yet, loss of sight from this cause is comparatively rare. Thousands of children suffer from dentition, and thousands of adults from toothache; yet, none of them become blind in consequence. In some of the worst cases of that form of *neuralgia*, called *tic douloureux*, vision is not impaired, and blindness does not seem to have followed any of the operations formerly so much practised, of dividing the branches of the nerve. It has been asserted, that blindness from injury of the supra-orbital branch of the fifth nerve has been cured by cutting it across, but it has so often failed in other hands, that additional instances are required. Dr. Galenzowski, a Polish professor, states, that severe neuralgia and blindness, was cured by extracting a carious tooth, in which a bit of stick was found, but "a probe passed into the antrum, from which a few drops of matter escaped," and therefore, this cannot be considered a simple case of mechanical injury of

nerve alone. In considering the connexion between the optic and fifth nerves, we must not lose sight of the fact, that where there is great intolerance of light, as in mismanaged ophthalmia in children, violent sneezing is produced by exposing the eye to light, proving that an impression is made directly or indirectly on the branches of the fifth nerve in the eye, which appears to be felt by the branches of the same nerve in the nostril. The subject is of great importance, involving as it does, the question of the value of stimulant applications to the conjunctiva, skin, or nostril in amaurosis, and upon the whole, I think it must be admitted, that the facts are in favour of the value of such remedies.

As cases of disease affecting the fifth nerve should be recorded, until doubtful points are cleared up, I will here briefly state one which was under my care some time ago in the City of Dublin Hospital, and which was most faithfully and perfectly reported by Mr. Croker King, then resident surgeon. The patient was a labouring man, 59 years of age, and of intemperate habits. Five years ago he was operated on for cancer of the lower lip, which has never returned. Twelve months after the operation, he felt a sensation of heat and "tingling" on the right side of the cicatrix, which after some time changed to a "creeping," which gradually extended to the side of the face and head, and became a "prickling," followed by severe darting lancinating pain, impaired power of deglutition, and articulation, with a warm feel about the fauces. Five months ago, the right eye became inflamed, and in two months more was disfigured and vision destroyed. On admission, his general health appeared good, but at intervals, both night and day, he suffers from darting pains, of the most excruciating description. The right side of the face feels numb, and is insensible to a light touch. When pinched or rubbed, slight sensation follows. The conjunctiva is completely insensible, and the cornea opaque. There is no distortion of the face, but there is a depression of the temporal muscle, and a flatness of the masseter. When desired to put out the tongue, both chin and tongue turn to the right, the affected side; and when desired to close his teeth, both the temporal and masseter muscles remain relaxed: he cannot masticate at the right side of his mouth. The

sense of smell is perfect in both nostrils, but sensation is lost on the right side of the tongue. Saline and bitter substances, placed on the right side of the tongue, at the tip, were not perceived, but were instantly recognized when applied to the left. Various odoriferous substances held to the right nostril, the left being closed, were instantly recognized. A quill passed up the right nostril, was not felt in the slightest degree. Fumes of ammonia were not perceived, till they reached the soft palate and larynx. The case was treated with local applications of tobacco, in the form of stupe, smoking, and snuff, without relief. Belladonna plasters seemed to afford temporary improvement; and iodide of iron and subsequently the carbonate were given internally. As there was no amendment, he left the hospital, and has not since been heard of.

PARALYSIS FROM DISEASE OF THE SEVENTH NERVE.

Sudden paralysis confined to the *orbicularis palpebrarum*, and other muscles of the face supplied by the seventh nerve, or *portio dura*, from disease within the skull, does not appear to be a frequent occurrence. In what proportion of cases of common hemiplegia it occurs, I cannot tell. Slight distortion of the mouth, with loss of expression, is not uncommon; but complete paralysis of the orbicularis palpebrarum, causing exposure of the eye, does not appear to accompany such attacks so frequently. Cases are occasionally met with in which the mischief is to be traced to cerebral disease, and in which the "head symptoms" are unequivocal, but, in the majority, there is nothing of the kind. Even in cases of total blindness, with paralysis of the muscles supplied by the third and sixth nerves, or loss of sensibility from disease of the fifth, paralysis of the muscles of the side of the face and eyelids from implication of the seventh, is comparatively rare. The great cause of this paralytic affection is inflammation, involving the seventh nerve in its passage through the temporal bone and parotid gland. Persons are suddenly seized with it from exposure to currents of cold air when travelling in a coach or sitting in an open window; but here it is accompanied by pain of the ear, some deafness, and

even tenderness on pressure behind the angle of the jaw, and, therefore, the cause of the disease is easily ascertained, and all alarm as to its cerebral origin is dispelled. When arising from inflammation or abscess of the parotid gland, or some lymphatic gland, in the same situation, the cause is easily detected; and where it attends violent pain of the ear, with discharge of matter from the external passage, it is equally obvious. When it follows, as it sometimes does, severe injury of the head, with discharge of blood or transparent fluid from the ear, it is, of course, to be attributed to fracture of the base of the skull, traversing the temporal bone. It is important, as well for the safety of the patient, as for his peace of mind, that this fact of the paralysis occurring so much more frequently from disease implicating the nerve in its passage through the bone and gland, than from cerebral derangement should be recollected; and when it occurs without symptoms of disease of the brain, even although there should be no symptoms of disease of the ear, we are justified in concluding that it more probably depends on mischief in or about the ear than on injury of the nerve at its origin, or in its course within the skull. Of thirty-four cases recorded by Sir Charles Bell, four only appear to have suffered from disease of the brain, while fourteen or fifteen depended on disease of the ear or parotid gland; four or five from exposure to currents of air; seven from concussion or injury of the head, and the remainder without any obvious cause.

The effect of this palsy on the eye is very distressing and injurious. The motions of the lid, depending on the action of the orbicularis palpebrarum, are lost, and consequently the patient can neither close the eye to exclude light, to protect it from injury, or cover it during sleep. There is a constant trickling of tears down the cheek, and the conjunctiva becomes inflamed from exposure; so much so, that in many cases, unless some mechanical contrivance be adopted to keep the eye covered by the lids, vision is ultimately destroyed. This destruction, however, is clearly different from that which attends disease of the fifth nerve as I have already observed. Partial relief is obtained by turning up the cornea under the lid, by the action of the *levator* muscle.

PARALYSIS OF THE ORBICULAR MUSCLE OF THE IRIS.

There is another affection of the eye which must, I suppose, be considered paralytic. This is the sudden and permanent dilatation of the pupil, without any other defect of vision than that arising from this cause alone. The patient has, in fact, the same kind of scattered and confused sight which exists when the pupil is enlarged by belladonna. There is no squint, no muscular paralysis, and no loss of sensibility of the retina, for he can see well through a small aperture, as a pin-hole in a card. In some cases at least, the contraction of the pupil is not entirely suspended: it contracts slightly when the eye is directed to a strong light, or when an effort is made to distinguish a near object; it also contracts slowly and slightly on stimulating the conjunctiva with any irritating fluid, or even with the point of a camel's-hair pencil. I have one of these cases under my care while I write. It has existed for more than a month, and I find no other symptom of disease of any other part. Remedies to set the digestive and biliary organs in order have been used with little effect. I dropped a solution of strychnine in distilled vinegar, (about a grain to a drachm) into the eye, without causing greater contraction of the pupil than the vinegar alone would produce. I have blistered over the eye-brow, and dressed the surface with an ointment containing strychnine, under which treatment the pupil is becoming smaller. I have seen the pupil gradually recover in one or two of these cases, without any medical treatment. This is the disease called *mydriasis* in the books, and it must not be confounded with the dilatation of pupil which accompanies paralysis, from disease of the third nerve, or from injury of the head, or a blow on the eye, It is said never to occur in both eyes, and I never saw it in both. It has been proposed by M. Serres, a French practitioner, to cure it by burning the edge of the cornea with nitrate of silver; but as stimulating applications of less destructive quality are probably equally efficacious, they may, perhaps, be preferred. The cause of this paralysis, if we are so to consider it, has not been positively ascertained. It certainly does not, for the

reasons assigned, depend on insensibility of the retina, and we have no evidence that it depends on disease of the fifth and sixth nerves. Dilatation of the pupil, I believe, always attends paralysis of the muscles of the eye from disease of the third nerve, in consequence, probably, of the distribution of its branches to the iris, through the lenticular ganglion; it is, therefore, probable, that this dilatation here alluded to arises from some slighter derangement of the function of this nerve; and it is, on that account, safer to look upon it as affording evidence that all is not right, as far as the nervous system is concerned.

It is highly important and interesting, in every point of view, to determine how far squint, or want of unison in the motions of the eye, depends on impaired power of any of the muscles from causes injurious to the structure or function of the nerves. This paper has, however, already so far exceeded the limits assigned to it, that I cannot venture to touch upon the subject here; it being one which would necessarily require much discussion and inquiry. Perhaps I may return to it at a future period; and, in the meantime, I can refer the reader to the works of Mr. Lucas, and Mr. Duffin, on strabismus, and Mr. C. W. Guthrie's report on the same subject, which contain much information on this point; also, to Dr. Marshall Hall's works, and to Mr. Walker's book on the philosophy of the eye.

DUBLIN:
PRINTED AT THE OFFICE OF THE MEDICAL PRESS.